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**PINNIPED POPULATIONS AT ISLAS GUADALUPE,
SAN BENITO, AND CEDROS,
BAJA CALIFORNIA, IN 1965**

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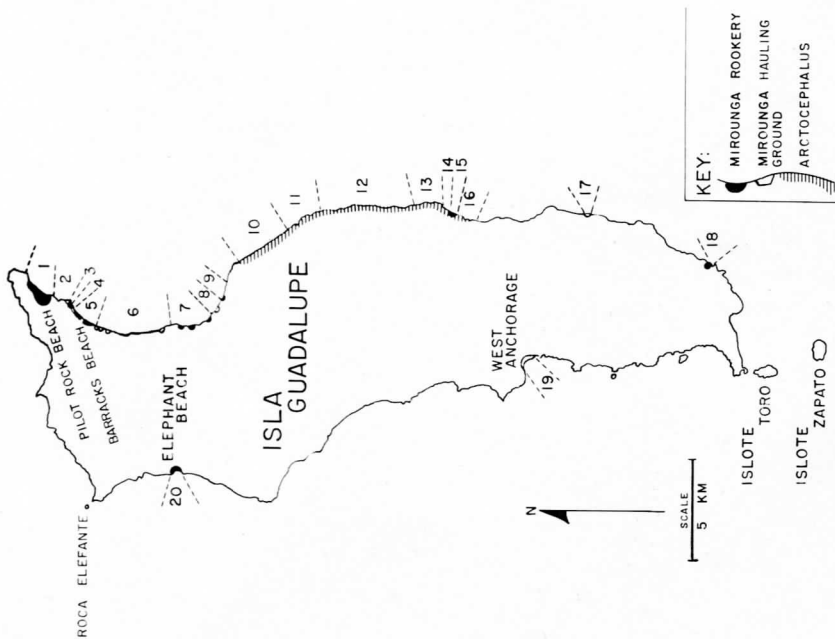


Fig. 1. Isla Guadalupe, Baja California, showing the census areas listed in table 2, the location of elephant seal rookeries and hauling grounds, and the area occupied by fur seals.

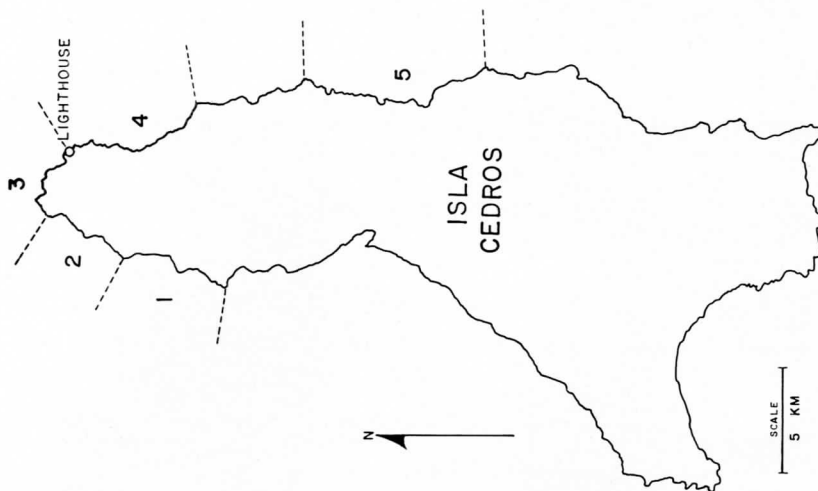


Fig. 2. Isla Cedros, Baja California, showing the census areas listed in table 2.

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Between January 28 and February 3, 1965, we made censuses of the northern elephant seals, *Mirounga angustirostris*, Guadalupe fur seals, *Arctocephalus philippii townsendi*, and California sea lions, *Zalophus californianus californianus*, inhabiting Isla Guadalupe, the Islas San Benito, and Isla Cedros, Baja California, Mexico. This project was a cooperative effort of the Mexican Instituto Nacional de Investigaciones Biológico Pesqueras (INIBP) and the U. S. Fish and Wildlife Service (FWS). The censuses were made during whale-marking cruises of the whale catcher boats *Lynnann* and *Sioux City*, under charter from the Golden Gate Fishing Company of Richmond, California.

These three species of pinnipeds are of particular interest to biologists and conservationists. The elephant seal, nearly extinct before the turn of the century, has experienced a rapid population growth. The population may now be leveling off on Guadalupe, where regulated exploitation is being considered. Over 90 percent of the northern elephant seal population breeds on Isla Guadalupe and the Islas San Benito. The Guadalupe fur seal was heavily exploited during the last century, and until 11 years ago was feared extinct. The population apparently has only recently entered a phase of rapid growth. The fur seal is known to breed only on Isla Guadalupe. The California sea lion is abundant and unexploited (except for a small number taken in the Gulf of California). There has been agitation, especially in California, for reduction of its numbers because of alleged damage to fisheries. The feasibility of rational exploitation of sea lions is now being considered. Islas San Benito and Isla Cedros harbor some of the largest rookeries and hauling grounds of this species.

Our censuses are particularly useful for determining population changes, because they were made at exactly the same time of year as censuses made 15 years previously by Bartholomew and Hubbs (1952). The number of pinnipeds hauled out on any rookery or hauling ground may change markedly throughout the year, depending on migrations and phases of the breeding cycle. Daily variations must also be considered.

ACKNOWLEDGMENTS

We wish to acknowledge the indispensable help of the crew members of the vessels: Captain Loyd Newton, Ernesto Gonzales, and Robert Young of the *Lynnann*; and Captain Donald Gamble, Gordon Holmes, and Julio Ninayahuar of the *Sioux City*. Joaquin Arvizu M. of the INIBP and Kenneth Balcomb III of the FWS assisted in making the counts. Lt. Pablo Vásquez V., commanding officer of the naval garrison on Isla Guadalupe, and his men offered valuable assistance. Carl L. Hubbs supplied much valuable information concerning pinnipeds on these islands, and made many useful criticisms of the manuscript. George A. Bartholomew supplied information on elephant seals in the Channel Islands, and reviewed the manuscript. Richard A. Jennings provided the elephant seal count for Año Nuevo Island. Victor B. Scheffer and Ford Wilke reviewed the manuscript.

METHODS

We made our counts in three ways, depending upon terrain and sea conditions: (1) by walking the beaches; (2) by following the shoreline in outboard-powered skiffs; or (3) by cruising as closely as possible along shore with the *Lynnann* and *Sioux City*, which are 41 m. (135 ft.) long and draw about 3 m. (10 ft.).

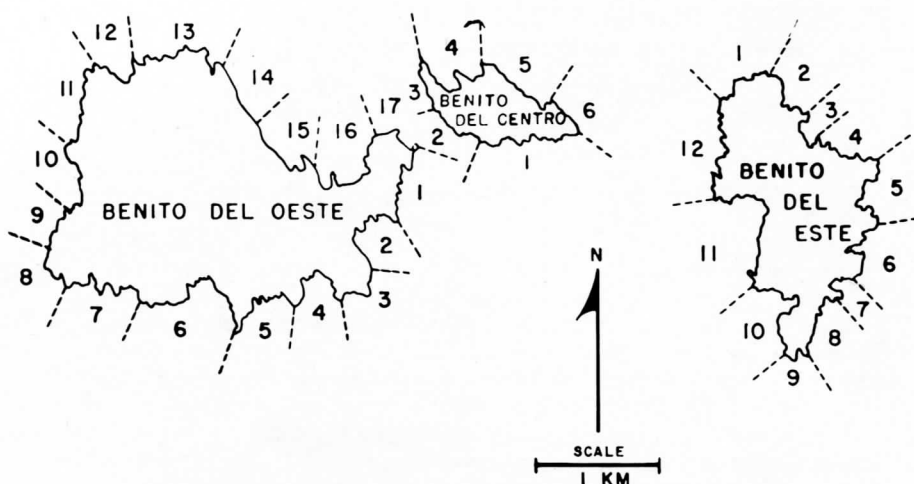


Fig. 3. Islas San Benito, Baja California, showing the census areas listed in table 2; these areas are the same as those used by Bartholomew and Hubbs (1952).

When it was impossible to count every individual in large compact masses of sea lions and elephant seals, we counted sample sectors containing 10 to 100 animals, and estimated the total number by visually dividing the total occupied area into sectors equivalent to the counted sample areas.

Isla Guadalupe, January 28-31.— We covered on foot all portions of the east shore inhabited by fur seals, except for certain small areas (see below) that were too precipitous; in such areas we used a small boat. We also covered on foot the largest elephant seal rookeries— those at Pilot Rock Beach and the Barracks Beaches. The sector between these two rookeries was observed from a small boat. We followed the remainder of the east shore and all of the west shore in the *Lynnann*, about 0.5 to 1 km. offshore. We circled Isote Zapato in a small boat. Isote Toro, which we observed from the *Lynnann*, apparently is not used by pinnipeds, as it has no suitable hauling-out areas.

Islas San Benito, February 2-3.— We walked almost entirely around Benito del Oeste, except for a short sector at the west end of the south shore that was impassable. The latter we observed from a skiff. The surf prevented us from landing on Benito del Centro and Benito del Este, but we circumnavigated them in a small boat less than 0.25 km. off shore.

Isla Cedros, February 3.— The entire east shore and the southern half of the west shore were followed with the vessels *Lynnann* and *Sioux City*, respectively. The northern half of the west shore was observed from a small boat.

RESULTS

The counts are summarized in table 1; details for each island appear in table 2 and figures 1 to 3. Because Bartholomew and Hubbs (1952, 1960) and Hubbs (1956) reviewed the history of the pinniped populations on these islands and cited the earlier literature, we have alluded only briefly to past censuses.

Elephant Seals.— January is the height of the breeding season of the northern elephant seal (Bartholomew, 1952). At the time of our observations nearly all the pups had probably been born, and the number of breeding adults was probably near maximum. When censusing large groups of elephant seals, we found it impossible to count all the pups, because many were concealed by the much larger adults. We made complete counts of living pups at two

TABLE 1
Summary of 1965 pinniped censuses on Isla Guadalupe (Jan. 27-31),
Islas San Benito (Feb. 2-3) and Isla Cedros (Feb. 3).

| Island | <i>Mirounga</i> | | | <i>Arctocephalus</i> | <i>Zalophus</i> |
|---------------------|-------------------------|--------------------|--------|----------------------|-----------------|
| | 1 year old and older | Pups | Total | | |
| Isla Guadalupe | 6,721 | 3,668 ¹ | 10,389 | 285 | 585 |
| Islas San Benito | | | | | |
| Benito del Oeste | 967 | 376 | 1,343 | | 2,596 |
| Benito del Centro | 448 | 174 ¹ | 622 | | 2,236 |
| Benito del Este | 645 | 250 ¹ | 895 | | 2,326 |
| San Benito subtotal | 2,060 | 800 | 2,860 | | 7,158 |
| Isla Cedros | 47 | | 47 | 3 | 8,407 |
| Grand total | 8,828 | 4,468 | 13,296 | 288 | 16,150 |

¹Calculated number; see text.

rookeries and found the ratio of adults to pups. At the North Barracks Beach rookery at Isla Guadalupe, the ratio was 1 : 0.57. At the other large rookeries on Isla Guadalupe we counted only the animals older than pups, and estimated the number of pups by assuming that the ratio was the same as found at the North Barracks Beach rookery. If hauling grounds as well as rookeries are included, the ratio of older animals to pups on Guadalupe is estimated at 1 : 0.55. Along the entire shoreline of Isla Benito del Oeste, the ratio of older animals (including those on hauling grounds as well as those on rookeries) to pups was 1 : 0.39. Among the many groups of elephant seals on Benito del Centro and Benito del Este, we did not distinguish between rookeries and hauling grounds; to estimate the number of pups, we applied the Benito del Oeste proportion.

In the early 19th century, according to Scammon (1874), elephant seals occupied many rookeries and hauling grounds along the coast and on offshore islands, from Point Reyes, California (38°00' N) south to Cabo San Lazaro, Baja California (24°48' N). Subsequently, they were nearly exterminated, and by 1892, as far as is known, only 20 to 100 animals remained, all on Isla Guadalupe. In the following 68 years they increased to an estimated 15,000 (Bartholomew and Hubbs, 1960) and recolonized parts of their former range (see below).

In January and February, 1950, Bartholomew and Hubbs (1952) counted 4,548 elephant seals on Guadalupe. This count included only animals one year old and older (Bartholomew, *in litt.*). In January, 1960, Bartholomew and Hubbs (1960) counted 9,000 elephant seals on the east shore of Guadalupe, and estimated 11,000 on the entire island, including pups. We counted 6,721 seals older than one year, and estimated 3,668 pups, for a total of 10,389. These counts suggest that the Guadalupe population reached a peak by 1960, and has stopped growing.

One factor tending to limit further population growth may be increased mortality of pups because of crushing by the adults (see Bartholomew, 1952:392) on the crowded rookeries (fig. 4). Although we did not count the dead pups, there were many on the upper edges of the beaches (fig. 5) above the breeding aggregations, where some of the moribund pups crawl. Many other dead pups could be seen when the tightly packed adults moved about. Some were almost completely buried in the sand. Several dead pups were seen floating in the water off the rookeries. These observations indicate that only a small percentage of the pup carcasses was visible. Studies should be made to determine the extent and causes of pup mortality in relation to population density on the rookeries.



Fig. 4. Female elephant seals on the rookery at North Barracks Beach, Isla Guadalupe. Such dense crowding results in many pups being crushed to death, as the one in the lower left. January 28, 1965. (KWK 65-2-15)

Elephant seals re-established themselves on the Islas San Benito by 1918; in 1950, Bartholomew and Hubbs (1952) counted 908, excluding pups. Our count of 2,060, excluding pups, suggests that the San Benito population is still increasing at about the same rate as the Guadalupe population did during its phase of rapid growth (Bartholomew and Hubbs, 1960).

The elephant seals apparently have only recently recolonized Isla Cedros. Hubbs and Bartholomew (1952) found none there in 1950, but they did not examine the west coast. We saw 36 elephant seals hauled out on a small beach on the west side of the island 1 km. south of the north end; we were too far offshore to see if any pups were present. Eleven solitary males were seen around the north end of the island.

Over 90 per cent of all breeding northern elephant seals breed on Guadalupe and the Benitos. Elsewhere, elephant seals breed or regularly haul out on the Islas Los Coronados, Baja California, and on Santa Barbara, San Nicolas, San Miguel, Santa Rosa, and Anacapa islands of the Channel Islands off southern California. In central California, they have recently established a rookery on Año Nuevo Island north of Santa Cruz, and they sometimes haul out on the Farallon Islands, on Point Reyes, and on Seal Rock near Monterey (Radford, Orr, and Hubbs, 1965). Studies now under way by George A. Bartholomew in the Channel Islands, and by the Stanford Research Institute on Año Nuevo Island (Orr and Poulter, 1962, 1965), along with our observations, provide a census of the total elephant seal population in January-February, 1965 (table 3). The counts total 9,221 adults and 4,851 pups, for a total of over 14,072 on all known rookeries and hauling grounds. To this number may



Fig. 5. The carcasses of at least 25 elephant seal pups are visible here on the landward side of the North Barracks Beach rookery, Isla Guadalupe, January 28, 1965. (KWK 65-2-18)

be added 20 per cent (Bartholomew and Hubbs, 1960) as a conservative estimate of the animals, mostly immature, at sea, for a grand total of about 17,000 at the high point of the year. This value may be compared with the Bartholomew and Hubbs (1960) estimate of 15,000 animals in 1960. In summary, the population of northern elephant seals seems to have leveled off on Isla Guadalupe, but elsewhere this species is still expanding its range and increasing its numbers.

Guadalupe Fur Seals. — We counted 285 fur seals on Isla Guadalupe. Fur seals regularly occupy only a 13 km. sector of the eastern shore of Guadalupe. We covered this entire sector on foot, except for the northernmost 2 km. (a section with very few seals), which we surveyed from a small boat. We also covered by small boat at least 1 km. of shoreline to the north and south beyond the last observed seals. Although we may have missed a few seals that were hidden behind boulders, we believe that the total number of animals hauled out at the time of our visit did not exceed 300.

In 1950, Bartholomew and Hubbs (1952), despite a careful search by small boat along most of the east coast, failed to find any fur seals on Isla Guadalupe, and the species was thought to be extinct. A few fur seals must have been present at that time, but the population was certainly much smaller than now. The east shore of the island was closely navigated by small boat everywhere except along the very sector where the fur seals now occur, as shown on fig. 1 (Hubbs, *in litt.*). The species was rediscovered in November, 1954, by Hubbs (1956), when 14 fur seals were located at the northernmost point of their present range, after none were seen in running close along the entire east coast from the south end to the point

TABLE 2

Details of 1965 pinniped censuses on Islas Guadalupe, San Benito, and Cedros.

The area numbers refer to the maps (figs. 1-3).

| Area | Date | <i>Mirounga</i> | | <i>Arctocephalus</i> | <i>Zalophus</i> |
|-----------------------|---------|-------------------------|--------------------|----------------------|-----------------|
| | | 1 year old and older | Pups | | |
| Isla Guadalupe | | | | | |
| 1 | Jan. 28 | 2,700 | 1,550 ¹ | | |
| 2 | " " | 18 | | | |
| 3 | " " | 97 | 56 ¹ | | |
| 4 | " " | 37 | | | |
| 5 | " " | 1,255 | 720 ¹ | | |
| 6 | " " | 55 | | | |
| 7 | " " | 1,100 | 631 ¹ | | |
| 8 | " " | 35 | | | |
| 9 | " " | 7 | 3 | | |
| 10 | Jan. 29 | | | 8 | |
| 11 | " " | | | 17 | |
| 12 | " " | | | 184 | |
| 13 | " " | | | 25 | |
| 14 | " 30 | | | 41 | |
| 15 | " 28 | 19 | 9 | | |
| 16 | " 30 | | | 10 | |
| 17 | " 28 | 1 | | | |
| 18 | " " | 28 | 10 | | |
| 19 | " 31 | 169 | | | |
| 20 | " " | 1,200 | 689 ¹ | | |
| I. Zapato | " 30 | | | | 585 |
| Totals | | 6,721 | 3,668 | 285 | 585 |
| Isla Benito del Oeste | | | | | |
| 1 | Feb. 2 | 19 | 7 | | 24 |
| 2 | " " | 6 | | | 29 |
| 3 | " " | 148 | 58 | | 85 |
| 4 | " " | 190 | 74 | | 100 |
| 5 | " " | 29 | 14 | | 338 |
| 6 | " " | 64 | 7 | | 559 |
| 7 | " " | 13 | | | 115 |
| 8 | " " | 7 | 1 | | 325 |
| 9 | " " | 50 | 24 | | 270 |
| 10 | " " | 235 | 116 | | 335 |
| 11 | " " | 61 | 22 | | 275 |
| 12 | " " | 43 | 14 | | 113 |
| 13 | " " | 7 | | | |
| 14 | " " | 1 | | | |
| 15 | " " | | | | |
| 16 | " " | 84 | 39 | | |
| 17 | " " | 10 | | | 28 |
| Totals | | 967 | 376 | | 2,596 |

TABLE 2 (Continued)

| Area | Date | Mirounga | | Arctocephalus | Zalophus |
|------------------------|--------|-------------------------|------------------|---------------|----------|
| | | 1 year old and older | Pups | | |
| Isla Benito del Centro | | | | | |
| 1 | Feb. 2 | 79 | No data | | 456 |
| 2 | " " | 14 | " | | 230 |
| 3 | " 3 | 208 | " | | 885 |
| 4 | " " | 132 | " | | 415 |
| 5 | " " | 14 | " | | 145 |
| 6 | " " | 1 | " | | 105 |
| Totals | | 448 | 174 ¹ | | 2,236 |
| Isla Benito del Este | | | | | |
| 1 | Feb. 2 | 3 | No data | | 136 |
| 2 | " " | 2 | " | | 134 |
| 3 | " " | 1 | " | | 72 |
| 4 | " " | 1 | " | | 102 |
| 5 | " " | 51 | " | | 337 |
| 6 | " " | 16 | " | | 111 |
| 7 | " " | 46 | " | | 255 |
| 8 | " " | 1 | " | | 68 |
| 9 | " " | 12 | " | | 96 |
| 10 | " " | 161 | " | | 335 |
| 11 | " " | 342 | " | | 404 |
| 12 | " " | 9 | " | | 276 |
| Totals | | 645 | 250 ¹ | | 2,326 |
| Isla Cedros | | | | | |
| 1 | Feb. 3 | | | | 1,340 |
| 2 | " " | 3 | | | 1,396 |
| 3 | " " | 43 | | | 1,441 |
| 4 | " " | 1 | | | 4,230 |
| 5 | " " | | | 3 | |
| Totals | | 47 | | 3 | 8,407 |

¹Calculated number; see text.

of discovery (Hubbs, *in litt.*). Counts made between 1954 and 1963 are not fully comparable with our count, because along most of the shore they were made from small boats, rather than by consistently walking the shoreline. We have found that observers in small boats miss many seals. The shoreline of Guadalupe where the seals haul out is largely a jumble of enormous, blackish boulders, of essentially the same color as the seals, at the foot of rugged volcanic cliffs that are undercut by many sea caves. The seals are scattered singly and in small groups, and hide in the caves and in the crevices and tide-pools beneath and behind the boulders and ridges. Many seals can be found only by an observer on shore who carefully searches all these hiding places. However, the repeated censuses by parties from Scripps Institution of Oceanography have definitely shown a marked increase, because many more have been seen recently from a skiff than were formerly observed (Hubbs, *in litt.*).

TABLE 3
World population of the northern elephant seal in 1965.

| Island | Year reoccupied ¹ | Population in 1965 | | | Authority ² |
|----------------------|---------------------------------|-------------------------|---------|--------|--|
| | | 1 year old and older | Pups | Total | |
| Isla Guadalupe | | 6,721 | 3,668 | 10,389 | Present paper |
| Islas San Benito | 1918 | 2,060 | 800 | 2,860 | Hanna, 1925; present paper |
| Isla Cedros | 1965 | 47 | 0 | 47 | Present paper |
| Islas Los Coronados | 1948 | 1 | 0 | 1 | Bartholomew, 1950; present paper ³ |
| Santa Barbara Island | 1948 | 4 | 0 | 4 | Bonnot, 1951; present paper ⁴ |
| San Nicolas Island | 1949 | No data | No data | | Bartholomew, 1951 |
| San Miguel Island | 1925 | 252 | 311 | 563 | Rett, 1952; present paper ⁵ |
| Santa Rosa Island | 1965 | ? | 14 | 14 | Present paper ⁶ |
| Anacapa Island | 1958 | No data | No data | | Bartholomew and Boolootian, 1960 |
| Año Nuevo Island | 1955 | 136 | 58 | 194 | Orr and Poulter, 1962; Jennings, <i>in litt.</i> ⁷ |
| Totals | | 9,221 | 4,851 | 14,072 | |

¹Year of first published observation; reoccupation may have occurred somewhat earlier. In most localities the year of first breeding is unknown.

²Where two references are cited, the first refers to the year of reoccupation, the second to the 1965 population.

³Incomplete count made March 15 by Rice.

⁴Count made March 20 by Balcomb.

⁵Count made March 20 and 21 by Balcomb.

⁶Count made April 11 by Balcomb.

⁷Count made January 30 by Jennings.

Three other counts are comparable with ours, having been made on foot. Lluch and Pilson (Lluch, Irving, and Pilson, 1964) found 240 seals in February, 1964. Hubbs (*in litt.*) and party counted 252 in November, 1964, and 211 in March, 1965.

About two-thirds of the seals that we saw appeared to be less than a year old. Some were very small, though none had black natal pelage. Analogy with the northern fur seal, *Callorhinus ursinus*, suggests that the breeding season had terminated at least 15 weeks previously (Bauer, Peterson, and Scheffer, 1964). The only published observations on the breeding season of the Guadalupe fur seal are Scammon's (1874) statement that they bring forth their young between May and August on the California coast, and Townsend's (1899) reference to an unnamed sealing vessel in 1880 that "reported that the young were born about the middle of June" on Guadalupe. These observations agree with those of parties from Scripps Institution (Hubbs, *in litt.*).

Because of the scarcity of adults, especially males, we believe that most of them were at sea at the time of our count. We saw several individuals at sea within 22 km. of the island, and on January 31 Balcomb identified one at 29°16' N, 117°24' W, 88 km. ENE from Guadalupe. A. W. Anthony (in Thoburn, 1899) wrote: "In conversation with those who sealed there [Guadalupe] when the species was common I learn that the old bulls left the females and pups as soon as the latter were a week or so old, and were not seen again until the following year. It is thought that they go to sea . . ." In the northern fur seal, young of the year constitute about one-third of the population (Kenyon, Scheffer, and Chapman, 1954). If the same holds true for the Guadalupe fur seal, 200 young animals would suggest a total population of about 600. The population seems to be entering a phase of rapid logarithmic growth.

At Isla Cedros on February 3, 1965, we observed three Guadalupe fur seals in shallow water 25 m. off the beach about half way down the eastern shore. None was hauled out. On March 12 and 13, 1965, Rice revisited the site and saw possibly 10 small otariid seals in the

water near the beach. Because they were very shy, and surfaced only momentarily, it was impossible to ascertain whether they were fur seals or young sea lions. At least 10 km. of the adjacent shoreline was carefully scrutinized, but no animals were hauled out. Prior to our visit, fur seals had not been found on Cedros for over a century. We do not know whether these fur seals represent a resident colony or whether they are wanderers from Guadalupe.

California Sea Lions.—Sea lions breed during the summer; at the time of our counts, the young of the year were well grown and we did not attempt to record them separately. Our counts of sea lions, compared with the 1950 counts of Bartholomew and Hubbs (1952), revealed an increase from 165 to 585 in the population at Islote Zapato off Isla Guadalupe, a decrease from 9,700 to 7,200 at the Islas San Benito, and an increase from 340 to 8,400 at Isla Cedros (the count for Cedros in 1950 included only the east shore). The total for all these islands had increased from about 10,000 to about 16,000.

One possible explanation is that the San Benito population, following heavy exploitation in 1939, has increased enough to occupy all the available habitat, and that the surplus animals have moved to Cedros. Other possibilities are that California sea lions may alternately use several different hauling grounds, or that they spend variable periods at sea and on shore. On March 13, 1965, on the east side of Cedros south of the north lighthouse, Rice counted only 2,850 sea lions, compared with 5,671 in the same area 38 days earlier.

The seasonal movements of California sea lions are poorly understood. As did Bartholomew and Hubbs (1952), we found few adult males. Many adult males move north during the winter. Over 10,000 males annually congregate at that season on Año Nuevo Island near Santa Cruz, California, north of the breeding range of the species (Orr and Poulter, 1965), and a few males are seen regularly in winter as far north as Sea Lion Caves, Oregon (Kenyon and Scheffer, 1962; Rice, unpublished field notes), and occasionally off Washington (Kenyon and Scheffer, 1962) and Vancouver Island, British Columbia (Cowan and Guiguet, 1956). Some adult males remain in the south, however, as we saw several at sea; we also saw one hauled out at Cabo San Lucas, the southern extremity of the present range of the species. Hubbs (*in litt.*) has found that Isla Guadalupe is often invaded in the winter by adult males, possibly from the San Benitos. At Guadalupe, as elsewhere, however, we saw very few adult males.

SUMMARY

We made a census of northern elephant seals, *Mirounga angustirostris*, Guadalupe fur seals, *Arctocephalus philippii townsendi*, and California sea lions, *Zalophus c. californianus* on Isla Guadalupe, the Islas San Benito, and Isla Cedros, Baja California, Mexico, between January 28 and February 3, 1965, exactly 15 years after a similar census by Bartholomew and Hubbs. According to our counts and estimates, there were 6,700 elephant seals older than one year and 3,700 pups on Guadalupe; 2,100 older animals and 800 pups on the San Benitos; and 47 adults on Cedros. The population appears to have leveled off on Guadalupe; crushing of pups on overcrowded rookeries may be one factor. Elephant seals are increasing on the San Benitos, and were found on Cedros for the first time in recent years. The world population is about 17,000. We counted 285 fur seals on Guadalupe, and 3 at Cedros; as far as is known they breed only on Guadalupe. With an allowance for adults at sea, the total fur seal population is estimated at 600, and it appears to be rapidly growing. We counted 585 sea lions on Guadalupe, 7,200 on the Benitos, and 8,400 on Cedros.

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